HEALTH PHYSICS SOCIETY

Specialists in Radiation Safety

Background Information on
"STATE AND FEDERAL ACTION IS NEEDED FOR BETTER CONTROL OF ORPHAN SOURCES"
Position Statement of the Health Physics Society*
Adopted April 2002

Introduction

The Rules of the Health Physics Society (HPS) assign the responsibility "…for the preparation of impartial scientific and technical statements as it deems necessary" to the Society's Scientific and Public Issues Committee (S&PIC). In this capacity the S&PIC and the Society's President carry out the duties as Society spokesman in accordance with the Society By-laws. The S&PIC is composed of the President, President-elect, and the three most recent Past Presidents. The S&PIC has issued their "impartial scientific and technical statements" in various formats, but the most common method has been by means of formal "Position Statements." Position Statements of the Health Physics Society are intended to address fundamental issues of radiation-safety with the expectation they will be enduring in their nature. To avoid excessive length and detail in position statements the thoughts and discussion that provided the background to the primary recommendations may be captured in a S&PIC approved document to provide amplification and clarification of the position statement for those desiring further background and supporting information.

In April of 2002, the S&PIC issued a position statement titled, "STATE AND FEDERAL ACTION IS NEEDED FOR BETTER CONTROL OF ORPHAN SOURCES." This document provides background information on that position statement. It should be considered as an adjunct to the position statement and not a stand-alone document.

What is an Orphan Source?

An Orphan Source is taken to be a source of radioactive material that is not, but should be subject to regulatory control; a source subject to regulatory control, but has been abandoned, lost or misplaced; or a source that is subject to regulatory control, but has been stolen or removed without proper authorization (IAEA 2000)

How Many Orphan Sources Are There?

The number of devices in the U.S. containing radioactive sources is estimated to be approximately 2,000,000 (Meserve 2000). As many as 500,000 of these are unused and no longer needed or wanted (Lubenau & Yusko 2000).

Because disposal options are limited or too costly, unused or unneeded sources are often placed into unplanned long-term storage where some become vulnerable to loss, theft or abandonment, becoming orphan sources.

The Nuclear Regulatory Commission (NRC) estimated that approximately 375 sources are reported lost, stolen or abandoned each year, about one a day (Meserve 2000). The actual number is higher because not all such losses of control are reported.

Why are Orphan Sources a Concern?

Worldwide, at least 60 reported orphan source incidents have caused severe radiation doses to 266 unsuspecting members of the public (Yusko 2001). Of these, 39 individuals died as a result of their exposures. These accidents represent failures to meet the goal of the International Commission on Radiological Protection to avoid radiation exposures that lead to deterministic effects, i.e., preventing acute radiation injuries and deaths (ICRP 1990).

Orphan sources frequently become mixed with metal scrap destined for recycling. In the U.S., since 1983, over 500 radioactive sources have been reported found in metal scrap, with over half of these occurring since 1995 (Lubenau & Yusko 2000). If not detected and removed from the metal scrap, they cause contamination of metal products and byproducts and the metal making plants (Yusko 2000). In the U.S., there have been at least 33 incidents of this type. Cleanup, waste disposal, and other costs have been as much as $ 23 million per event in the U.S. (Lubenau & Yusko 1998). The Atomic Energy Act and NRC regulations, in addition to providing for the common defense and security and protection of health and safety, provide for protection of property (USNRC 1996). U.S. steel makers have called for government action to address the orphan source problem (AISI 1998, SMA 2000).

Because of the threat of orphan sources, all U.S. steel manufacturers have installed radiation detection systems to monitor incoming scrap metal[1], an expensive undertaking. Many manufacturers of other metals have also done so, as have many facilities that accept and process scrap metals. These programs, in addition to detecting orphan sources, have also detected scrap metals contaminated by Naturally Occurring Radioactive Material (NORM) and other radioactive materials.

The events of September 11, 2001, have focused attention on all forms of terrorism, including the threat of using radioactive materials (NCRP 2001, Karam, *et al.* 2002). Addressing the orphan source issue successfully will help limit the availability of radioactive materials for this purpose.

What is Being Done About Orphan Sources?

The International Atomic Energy Agency (IAEA) recognizes orphan sources as a problem requiring special worldwide attention and has undertaken a number of initiatives to strengthen regulatory oversight of radioactive sources by national authorities (Gonzalez 1999, IAEA 1999, IAEA 2001a, Yusko 2001, IAEA 2001b).

U.S. initiatives include rule making and related actions taken by the NRC to improve oversight of selected general licensees (USNRC 2000), a program to conduct a "roundup" of orphan sources that is sponsored by the Council of Radiation Control Program Directors (CRCPD) initially supported by EPA and now supported by NRC and DOE. (CRCPD 2000); a DOE program to recover orphan sources in emergency situations; another DOE program to accept unwanted transuranic sources (USNRC 1999, Tompkins and Pearson 2001); and U.S. Department of State support of IAEA initiatives by sponsoring a position in the IAEA specifically for work on orphan source issue (Lubenau 2001).

It should be noted that although actions are being taken to secure some orphan sources, these do not address the root causes of the problem.

Root Causes of the Problem Are Not Being Addressed

Root causes contributing to the orphan source problem are:

1. Existing U.S. programs do not encourage and facilitate the prompt disposition of unwanted or unneeded radioactive sources for disposal or transfer to environments which provide safe and secure storage, pending final decisions on their disposition. Many licensees possessing radioactive devices have had no contact with regulators and consequently are not familiar with obligations to provide for proper disposal.

2. Licensees in possession of unneeded or unwanted sources often discover that disposition options are severely limited. For example, the return of sources to manufacturers may be dependent upon whether the manufacturing company still exists, its willingness to accept the sources, conditions imposed by it upon such transfers and the cost for the service. Disposal of the source as waste is limited by low-level radioactive waste compact agreements on access to disposal sites, as well as limits on the types and quantities of radioactive material that may be disposed. Even when available, disposal has become so expensive that many licensees resort instead to unplanned, long-term storage. Disposal to the DOE is restricted to transuranics and to emergency situations when requested by the NRC.

3. Some current uses of radioactive sources, as well as U.S. national radiation protection policies, do not meet the International Commission on Radiological Protection (ICRP) principle of *justification* (ICRP 1985, ICRP 1990, ICRP 1997).

Beyond *justification, optimization* is not always practiced. In some cases, alternative technologies (to radioactive materials) such as x-ray generators may be both technically and economically feasible, but these are not always utilized by potential users.

Underlying these factors is the lack of a coordinated national commitment to make solving of the orphan source problem a national priority. As a result, funding to support State and federal initiatives has been slow to come and subject to uncertainty. The NRC has amended its regulations to increase oversight of selected categories of general licensees and made changes to its enforcement program. Continued NRC support for these and other necessary changes will be influenced by budgetary constraints coupled with competing program needs within the NRC. In this regard, it should be noted that because of past resource constraints, NRC staff delayed earlier implementation of changes (Lubenau & Yusko 1995). The CRCPD's program to "round up" orphan sources will be limited by availability of State resources to conduct the program and federal funding to support it.

Footnotes

1. Radiation detection systems are installed at steel mill plant entrance points where incoming shipments of metal scrap are inspected and weighed. If multiple shipment entry points are in use at a plant, then a radiation detection system will be needed for each. Despite technical advances, these systems cannot provide 100% assurance of detection of orphan sources. To provide defense-in-depth, some steel plants install costly additional monitoring systems within the plant. Operating costs are also incurred for training and auditing of personnel, for maintaining and upgrading equipment and for management oversight.

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* The Health Physics Society is a non profit scientific professional organization whose mission is to promote the practice of radiation safety. Since its formation in 1956, the Society has grown to approximately 6,000 scientists, physicians, engineers, lawyers, and other professionals representing academia, industry, government, national laboratories, the department of defense, and other organizations. Society activities include encouraging research in radiation science, developing standards, and disseminating radiation safety information. Society members are involved in understanding, evaluating, and controlling the potential risks from radiation relative to the benefits. Official position statements are prepared and adopted in accordance with standard policies and procedures of the Society. The Society may be contacted at: 1313 Dolley Madison Blvd,. Suite 402, McLean, VA 22101; phone: 703-790-1745; FAX: 703-790-2672; email: HPS@BurkInc.com.